"THE PARASITE"

An unobtrusive 144MHz portable colinear antenna

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THE PROBLEM was to devise a portable antenna which could hang from some kind host such as a tree or any nice high support, a friendly kite or even a balloon. More specifically, it was to be used to hang from the yard-arm or spreader of the yachts which I sail, and which are always of the class known as OPs (Other People's) hence the name of the antenna which became the final choice, and which is to be described below.

First, then, here are the desired attributes:

1. It must be portable and easily stowed away.
2. It must be highly robust.
3. It must be wind and water-proof (salt and fresh).
4. It must be "smooth", that is, it mustn't look ugly or unseaman-like, or in any way spoil the flow of wind into the sails, and it must not on any account have sharp places that could do untold damage to expensive sails.
5. It must be broadband and need no atu.
6. It must be fed from the bottom, since it is to be hauled up on a halyard, and the feeder is best arranged if it can come down alongside the downhaul.
7. It must have very low-angle radiation to reach the repeaters and the other vessels just over the horizon.
8. For obvious reasons it must be omni-directional.
9. It must be cheap.

Verticals fed against a groundplane were "out", because any such groundplane would involve radials from the base which might easily damage sails and rigging. Those 19·25in spikes round the base of a 7/8 whip would prove even worse than the ancient radar-reflectors, whose sharp corners must have been invented by sail-makers to keep them in business.

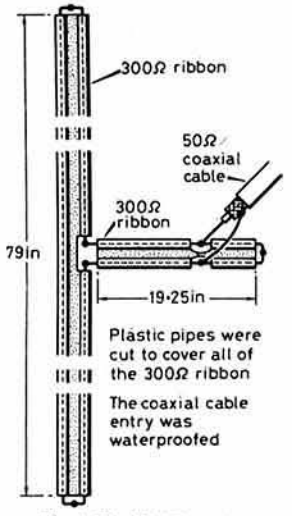

Fig 1. The Mk1 Parasite

So the next thought was for a vertical dipole, or better still a vertical colinear, for example the excellent ribbon feeder colinear (Fig 1). This became Mk1 and it was waterproofed by enclosing the whole thing in plastic piping. Performance was satisfactory but the feedpoint in the centre was a nuisance and the lateral pipe got in the way when hoisting, also it was a very difficult thing to get 7ft of plastic pipe into one's kitbag.

The final choice was a straightforward two half-wave colinear array with the phasing stub fed from a coaxial feeder which was led up through the lower element so that the feedpoint was at the bottom. Electrically the antenna is old-hat (Fig 2).

In order to achieve all our aims, the stub in the centre is coiled round the axis of the vertical elements, and the feedpoint is found which matches the 50Ω feeder which has been led up the centre of the lower element. The whole antenna can be coiled away, because the two 38·5in

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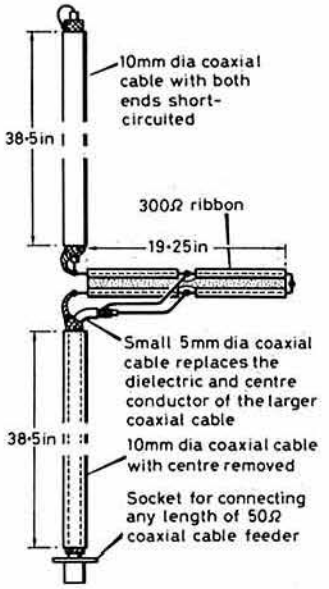
10mm dia coaxial cable with both ends short-circuited
38·5in
300Ω ribbon
19·25in
Small 5mm dia coaxial cable replaces the dielectric and centre conductor of the larger coaxial cable
38·5in
10mm dia coaxial cable with centre removed
Socket for connecting any length of 50Ω coaxial cable feeder

Fig 2. The electrical arrangement

lengths of the elements are made from the big-diameter coaxial cable such as Uniradio 67. The top element is used intact with the outer and inner conductors shorted top and bottom, while the lower element has its inner conductor and the dielectric carefully removed and replaced by a length of small-diameter coaxial cable which forms the feeder. This latter is soldered at the bottom to an SO239 socket, while at its top end it connects to the optimum match feedpoint. The ribbon feeder stub is cut to exactly 19·75in. The outside end of this is, of course, shorted (See Fig 3).

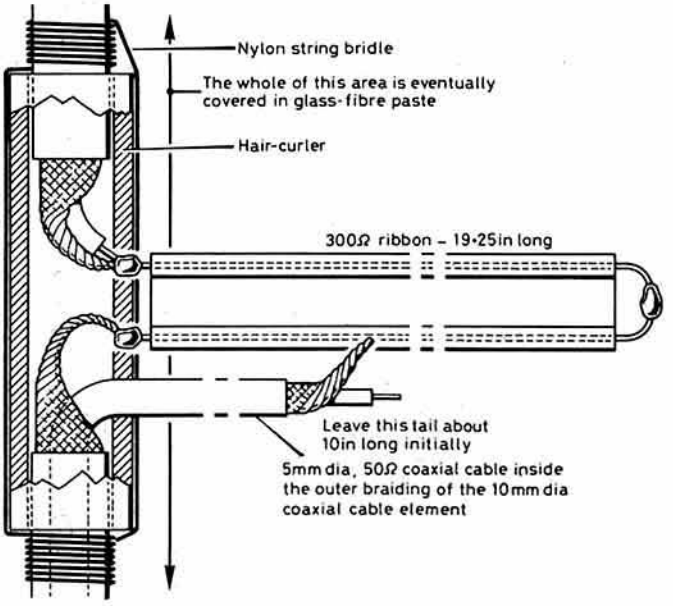
Nylon string bridle
The whole of this area is eventually covered in glass-fibre paste
Hair-curler
300Ω ribbon – 19·25in long
Leave this tail about 10in long initially
5mm dia, 50Ω coaxial cable inside the outer braiding of the 10mm dia coaxial cable element

Fig 3. Construction at centre

The constructor will need a few other items before starting the job. A tin of glass-fibre paste and the necessary hardener (as supplied for mending motor cars), and two further items which can be obtained from pretty-well any lady once she understands what is required, namely: two of those (usually blue or pink) rollers for winding hair onto to make it

permanently wavy. They must be 1in in diameter and about 3in long. They have holes all over them and little spikes to grip the hair. Ask for the kind that have shorter spikes because they make an excellent base for the glass-fibre construction.

To understand the construction, refer to the Figs 3, 4, 5 and 6. Having cut the two lengths of big coaxial cable, each exactly 38·5in from the top element, form the top element by trimming back the insulation and the dielectric and twist inner and outer conductors together and solder the resulting pigtail.

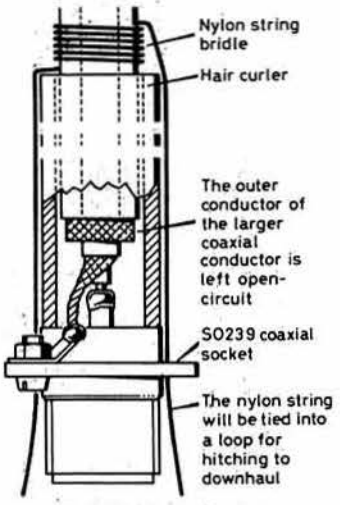
Nylon string bridle
Hair curler
The outer conductor of the larger coaxial conductor is left open-circuit
SO239 coaxial socket
The nylon string will be tied into a loop for hitching to downhaul

Fig 4. The base connector

The lower piece of big coaxial cable has its centre and the dielectric removed very carefully so as to preserve the cylindrical cavity, which is then filled by passing a length of smaller 50Ω coaxial cable up the tube, having first wound plastic tape round the smaller coaxial cable until it fits snugly in the space available. Pull about 10in of this cable through the braid of the lower element at its top end (about 1in down). Form the braid above this point into another pigtail, and solder. The bottom of the top element and the top of the bottom element, together with the small coaxial feeder, are then inserted into the opposite ends of a curler, and the pigtails bent through a right-angle and brought out together with the little coaxial feeder through the sides of the curler. The coaxial cable needs a larger hole to be made for it. It should be brought out just below the lower pigtail. The open end of the ribbon feeder is now soldered to the exposed pigtails.

The next important step is to provide longitudinal strength to the whole construction (it is to be hauled up and down by brawny seamen) so strong nylon string is used to form a bridle with a rolling hitch above and below the hair curler. These must be pulled very tight and are located in small nicks previously made in the plastic covering of the coaxial cable.

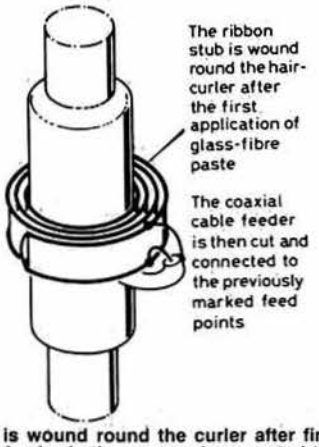
The ribbon stub is wound round the hair-curler after the first application of glass-fibre paste
The coaxial cable feeder is then cut and connected to the previously marked feed points

Fig 5. The ribbon stub is wound round the curler after first application of glass-fibre. The coaxial feeder is then cut and connected to the previously-marked feedpoint

At this stage mix the first dollop of glass-fibre paste. Stuff it liberally up the hair curler and smooth it down the sides. Cover the string bridle and spread the paste up and down the coaxial elements for 1–2in. Leave the ribbon stub and the tail of the coaxial feeder hanging free while the paste you have applied is setting. The whole thing should be hanging up under a light tension while this first setting is going on.

Next fit the second curler on the bottom end; here the bridle will form a loop on to which the downhaul is fastened. You will need to remember to push the hair curler over the bottom end of the lower element before soldering the inner (feeder) coaxial cable onto the SO239 socket. Mix more glass-fibre and fill the hair curler before pushing the socket into the base of the curler. Again smooth more paste over the outside and leave it to set.

Now hang the antenna in an open space and discover the optimum feedpoint on the ribbon. This is easily done with two pins (same source as the curlers) which are soldered to the conductors of the feeder coaxial cable. These you push through the top and bottom of the ribbon to make contact with the conductor. Start at about 4in from the shorted end and move inwards in little steps until you find the place where the swr meter between your transmitter, or other low power source of 145MHz, and the socket on the base of the antenna shows an swr of 1:1. Note this point and then coil the stub round the centre line of the antenna and fix temporarily with sticky tape while you make further adjustments to the pin positions since the coiling will have altered the optimum position somewhat. Mark the spot and remove pins. Cut the ribbon here and clean off the plastic so as to solder the coaxial feeder, now trimmed to suit, to the point on the ribbon previously marked.

Now mix a final lot of paste and cover the stub coil and the whole centre unit liberally. Give the thing a nice mysterious profile as shown in the figure.

The top of the whole is now fitted with a further nylon string bridle which will form a loop for hitching on the halyard. This bridle also is covered with glass-fibre to secure it and to waterproof the top of the coaxial cable. All three glass-fibre areas are now lacquered to waterproof them thoroughly. And there is your perfect Parasite. Hang it on something high and call CQ.

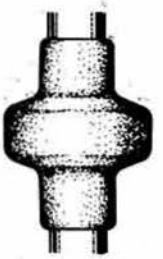

Fig 6. The coiled stub and the feeder are thoroughly waterproofed with glass-fibre paste

With a bow and arrow tied to a fishing line you can get it really high up a suitable tree (look on the other side of the tree first!). But the main use is for the signal halyard of your friend's yacht. If the mast is metal, choose the halyard as far away from it as you can. If the correct feedpoint has been found to give a 1:1 swr at 145MHz, the swr at the band edges will be found to be about 1:2. For fm working in the top half of the band, the constructor may prefer to tune it initially to 145·5MHz. This would give swr readings below 1:1·5 for the frequencies of interest.

The antenna has been tested over a whole season of sailing. It has met all the requirements outlined at the start, and has shown no signs of being affected by the weather. No detuning of the stub was detectable when tested after the "potting" of the coiled stub, and there was no appreciable change in the swr figures at the conclusion of an extensive cruise along the south coast of Ireland in some fairly wild weather.

On a wooden mast it can be hauled to the peak and forgotten about so far as the sailing is concerned; however, in the case of a metal mast this puts it too close to the mast, and the best place for it then is hanging from one of the spreaders. There is usually a signal halyard which can be pressed into service.

The Parasite was tested against a 5/8 vertical; at deck level the Parasite was generally better, probably owing to the difficulty in providing a good groundplane for the whip, but once the Parasite was hauled up into its proper place high in the rigging, there was no comparison. Reports from distant stations were pleasingly unanimous. The little creature does all that we asked of it.

I would like to record my thanks to Geoff Dixon, G8VFX/MM, skipper of the Ocean Youth Club ketch *Greater Manchester Challenge*, who helped with the testing and put up with a first mate who tended to festoon the doghouse with wires at the most awkward times, and to G1HVH/MM who also helped with the testing. □